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APPLIED MATERIALS, INC.  
Patent Department, M/S 2061  
P.O. Box 450A  
Santa Clara, CA 95052

EXAMINER

DHINGRA, RAKESH KUMAR

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1763

DATE MAILED: 02/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/797,286	Applicant(s) MURUGESH ET AL.	
	Examiner Rakesh K. Dhingra	Art Unit 1763	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 March 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 20 and 21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-21 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |  |
|---|--|
| <p>1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)</p> <p>2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</p> <p>3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br/>Paper No(s)/Mail Date <u>01/04, 12/04</u>.</p> | <p>4) <input type="checkbox"/> Interview Summary (PTO-413)<br/>Paper No(s)/Mail Date. _____.</p> <p>5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)</p> <p>6) <input type="checkbox"/> Other: _____.</p> |
|---|--|

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## **DETAILED ACTION**

### ***Election/Restrictions***

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-19, drawn to apparatus, classified in class 118, subclass 715.
- II. Claims 20, 21, drawn to method, classified in class 438, subclass 513.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the method specifies coupling energy to a cleaning gas in a remote chamber whereas apparatus does not specify a remote chamber and thus apparatus could be used for a materially different process.

Because these inventions are independent or distinct for the reasons given above and have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.

Because these inventions are independent or distinct for the reasons given above and the inventions require a different field of search (see MPEP § 808.02), restriction for examination purposes as indicated is proper.

During a telephone conversation with Ashok R Janah on 1/30/06 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-19. Affirmation of this election must be made by applicant in replying to this Office action. Claims 20, 21 are withdrawn from further consideration by the examiner, 37

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CFR 1.142(b), as being drawn to a non-elected invention. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

### ***Drawings***

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description:

Figures 1, 2 – Reference number 34 is not shown in these drawings as mentioned on page 6, line 3 of specification.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

The disclosure is objected to because of the following informalities:

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1) Page 7, line 14 – “at the first end 210” appears to be incorrect, since first end of hub 22 has reference number 24 (as per page 6, line 2 of specification and also per Figure 1).

Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Claims 1-6, 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murugesh et al (US Patent No. 6,450,117) in view of Tzu et al (US Patent No. 2003/0010451 and Halsey et al (US Patent No. 6,663,025).**

Regarding Claim 1: Murugesh et al teach an apparatus (Figure 1A, 2A, 2B) that includes a gas distributor 215 capable of distributing a gas across surfaces in a substrate processing chamber, the gas distributor comprising:

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- (a) a tubular post (hub) 259 comprising a gas inlet and a gas outlet,
- (b) a baffle 248 extending radially outward from the tubular post (hub) 259, the baffle having opposing first surface 251 and a second surface,
- (c) first ridges (vanes) 245 on the first surface of the baffle and where the first vanes direct the received gas across process chamber 30 surface (Column 6, line 20 to Column 7, line 30).

Murugesh et al do not teach second vanes on the second surface of the baffle and where the second vanes direct the received gas across the second surface of the baffle.

Tzu et al teach an apparatus (Figures 3, 6-8) that includes a baffle plate 36 coupled to lid 20a opposite the gas manifold 34. Tzu et al further teaches that bottom surface (second surface) 36b of baffle plate 36 has a mixing lip 704 that includes sculptured surface 802 or any similar surface features to control the flow of gases exiting the baffle plate (Paragraphs 0036-0040).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use surface features on bottom (second) surface of baffle plate as taught by Tzu et al in the apparatus of Murugesh et al to provide control of flow of gases exiting the baffle plate (Paragraphs 0039, 0040).

Murugesh et al in view of Tzu et al teach surface features on second surface of baffle plate but do not teach second vanes that direct the received gas across the second surface of the baffle.

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Halsey et al teach an apparatus (Figures 2, 3A-C, 4B) that includes a gas diffuser 200 that has a gas inlet nozzle 302, body and guide vanes 210, 212 on the opposite (second) surface of body (baffle) 202 to achieve flow uniformity.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use baffle plate with second vanes as taught by Halsey et al in the apparatus of Murugesh et al in view of Tzu et al to enable gas flow out of expansion spaces in equal amounts to achieve flow uniformity (Column 3, lines 1-10).

Regarding Claims 2, 3: Murugesh et al teach (Figures 2A, 2B) the baffle 248 further comprises an outer perimeter, and wherein each ridge (first vane) 245 comprises an arcuate plate that curves outward from the hub to the outer perimeter of the baffle.

Murugesh et al also teach that ridges (vanes) 245 are shaped and sized so that so as to enable fresh flow of gases over selected chamber surfaces (Column 7, lines 12-30).

Regarding Claim 4: Murugesh et al teach (Figure 1A) that gas distributor (including tubular post 259) 215 comprises first and second channels, and the gas outlet comprises the terminus of the first channels (247a) and the terminus of the second channels (247b) {Column 6, lines 20-50}.

Regarding Claims 5, 6: Halsey et al teach (Figures 3A-3C, 4B) that guide vanes (second vanes) 210, 212 comprise a plurality of surfaces that are inclined to the second surface of the body (baffle) 202, at least a portion of the inclined surfaces being below the terminus (exit point for gases flowing out of nozzle 302) of the second channels {Column 5, lines 45-55 and Column 7, lines 20-40}. Halsey et al also teach that number of guide vanes may be selected as per process requirements (Column 5, lines 30-35).

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Regarding Claim 8: Halsey et al teach that body 202 (baffle surface) can have any shape suitable for expanding gas flow (implies that shape or angle of guide vanes relative to body could be optimized) {Column 5, lines 15-35}.

**Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murugesh et al (US Patent No. 6,450,117) in view of Tzu et al (US PG PUB No. 2003/0010451) and Halsey et al (US Patent No. 6,663,025) as applied to claim 1 and further in view of Wheat et al (US PG PUB No. 2003/0116278).**

Regarding Claim 7: Murugesh et al in view of Tzu et al and Halsey et al teach all limitations of the claim except that second vanes comprise plurality of wedges.

Wheat et al teach an apparatus (Figure 1) that includes a gas distributor 10 with an inlet tube 14 and an outlet manifold 18 that has outlet holes 30 and baffle deflectors (vanes) 34 proximate each hole and that are like wedge-shaped. Wheat et al also teach that the deflectors 34 can have other configurations (Paragraph 0032).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use wedge shaped deflectors (vanes) as taught by Wheat et al in the apparatus of Murugesh et al in view of Tzu et al and Halsey et al to provide the required flow path to the exiting gases (Paragraph 0012).

**Claims 9, 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murugesh et al (US Patent No. 6,450,117) in view of Tzu et al (US PG PUB No. 2003/0010451) and Halsey et al (US Patent No. 6,663,025) as applied to claim 1 and further in view of Frijlink (US PG PUB No. 2004/0200412).**



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Regarding Claim 9: Murugesh et al in view of Tzu et al and Halsey et al teach all limitations of the claim except that hub has a gas feed-through tube capable of allowing a process gas to by-pass the first and second vanes and enter the chamber.

Frijlink teaches an apparatus (Figure 1) that includes a gas introduction arrangement that comprises concentric funnels (like gas feed through tube) that include inlet 1A for first precursor gas and inlet 1B for second precursor and enables the first gas to by-pass the vanes and enters the chamber (Paragraph 0024).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use hub with gas feed-through tube as taught by Frijlink in the apparatus of Murugesh et al in view of Tzu et al and Halsey et al to enable supply plurality of gases through gas distributor.

Regarding Claim 15, 17: Murugesh et al teach a substrate processing apparatus (Figures comprising

(a) a remote plasma source (includes remote chamber 120) 176 to activate a gas;  
(b) a process chamber 30 comprising chamber walls, interior chamber surfaces, a substrate support 40, a gas distributor 215, and a gas exhaust 108, the gas distributor 215 being capable of receiving the gas from the remote chamber 176 and distributing the gas (i) into the process chamber 30 (ii) along the chamber walls and interior chamber surfaces 55 and (iii) about the gas distributor, the gas distributor comprising:

(i) a tubular post (hub) 259 comprising a gas inlet, gas outlets 247a, 247b (ii) a baffle 248 extending radially outward from the hub, the baffle having a opposing first and surfaces 251 and a second surface,

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(iii) ridges (first vanes) 245 on the first surface of the baffle, and whereby the first vanes direct the gas across the enclosing walls and interior chamber surfaces (Column 6, line 20 to Column 7, line 30).

Murgugesh et al do not teach second vanes on the second surface of the baffle and where the second vanes direct the received gas across the second surface of the baffle.

Tzu et al teach an apparatus (Figures 3, 6-8) that includes a baffle plate 36 coupled to lid 20a opposite the gas manifold 34. Tzu et al further teaches that bottom surface (second surface) 36b of baffle plate 36 has a mixing lip 704 that includes sculptured surface 802 or any similar surface features to control the flow of gases exiting the baffle plate (Paragraphs 0036-0040).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use surface features on bottom (second) surface of baffle plate as taught by Tzu et al in the apparatus of Murugesh et al to provide control of flow of gases exiting the baffle plate (Paragraphs 0039, 0040).

Murugesh et al in view of Tzu et al teach surface feature on second surface of baffle plate but do not teach second vanes that direct the received gas across the second surface of the baffle.

Halsey et al teach an apparatus (Figures 2, 3A-C, 4B) that includes a gas diffuser 200 that has a gas inlet nozzle 302, body and guide vanes 210, 212 on the opposite (second) surface of body to achieve flow uniformity.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use baffle plate with second vanes as taught by Halsey et al in the

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apparatus of Murugesh et al in view of Tzu et al to enable gas flow out of expansion spaces in equal amounts to achieve flow uniformity (Column 3, lines 1-10).

Murugesh et al in view of Tzu et al and Halsey et al do not teach gas feed-through tube capable of allowing a process gas to by-pass the first and second vanes and enter the chamber.

Frijlink teaches an apparatus (Figure 1) that includes a gas outlet member (hub) 7 that includes concentric funnels (gas feed through tube) that includes inlet 1A for first precursor gas and inlet 1B for second precursor gas (Paragraph 0024).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use hub with gas fed through tube as taught by Frijlink in the apparatus of Murugesh et al in view of Tzu et al and Halsey et al to enable supply plurality of gases through gas distributor.

Regarding Claim 16: Murugesh et al teach (Figure 1c) that remote plasma chamber 130 comprises gas supply (inlet) 125, gas energizer (activator) 175, gas conduit (outlet) 170 [Column 4, line 40 to Column 5, line 40].

Regarding Claim 18: Halsey et al teach (Figure 4B) that the pairs of inclined surfaces (of guide vanes 210, 212) are oriented to direct the gas across expansion surface (of gas distributor) 464. Halsey et al also teach that number of guide vanes may be selected as per process requirements (Column 5, lines 30-35).

Regarding Claim 19: Frijlink teaches an apparatus (Figure 1) that includes a gas outlet member (hub) 7 that includes concentric funnels (like gas feed through tube) that is capable of distributing energized gas into process chamber (Paragraph 0024).

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**Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murugesh et al (US Patent No. 6,450,117) in view of Tzu et al (US PG PUB No. 2003/0010451) and Halsey et al (US Patent No. 6,663,025) as applied to claim 1 and further in view of Horie et al (US Patent No. 6,132,512).**

Regarding Claim 10: Murugesh et al in view of Tzu et al and Halsey et al teach all limitations of the claim except a process gas distributor with showerhead.

Horie et al teach an apparatus (Figures 13-15) that includes a gas ejection head having a gas supply head unit 50 with a double walled structure of an outer tube 51 connected to gas supply port 46 and inner tube 52 connected to showerhead plate 42 with holes 42-1 (Column 12, lines 15-68).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use gas distributor with showerhead as taught by Horie et al in the apparatus of Murugesh et al in view of Tzu et al and Halsey et al to avoid depositing of the reaction products on the gas distributor surfaces (Column 4, lines 60-65).

**Claims 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Redeker et al (US Patent No. 6,182,602) in view of Murugesh et al (US Patent No. 6,450,117), Tzu et al (US PG PUB No. 2003/0010451), Halsey et al (US Patent No. 6,663,025) and Frijlink (US PG PUB No. 2004/0200412).**

Regarding Claim 11: Redeker et al teach an apparatus (Figures 1, 13, 16) that includes a center gas feed (gas distributor) 312 to distribute a gas from an external source across surfaces in a substrate processing chamber 12 having a wall with a cavity, the gas distributor comprising:

(a) a base (hub) 334 that fits into the cavity in the wall of the chamber, the

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hub comprising (i) a plurality of first channels 342 in the base (hub) 334 that mates with the cavity, the first channels comprising openings and a terminus, the openings capable of receiving the gas from the external source (ii) a second channel 304 capable of receiving the gas from the terminus of the first channels, and

Redeker et al do not teach:

first channel along external surface of hub;

a baffle plate extending radially outward from the hub, the baffle plate comprising a first and second surface, an outer perimeter, and an aperture capable of allowing passage of the gas along the second channels;

first vanes on the first surface of the baffle plate, each first

vane comprising an arcuate plate that curves outward from the hub,

second vanes on the second surface of the baffle plate, each second vane comprising a surface inclined to the second surface of the baffle plate;

whereby the first vanes direct the gas across the surfaces of the chamber,

the second vanes direct the gas across the second surface of the baffle plate, and the

(iii) a gas feed-through tube that allows the gas to bypass the first and second set of vanes.

Murugesh et al teach an apparatus (Figure 1A, 2A, 2B) that includes a gas distributor 215 capable of distributing a gas across surfaces in a substrate processing chamber, the gas distributor comprising:

(a) a tubular post (hub) 259 comprising a gas inlet and a gas outlet and gas channel along external surface of tubular post (hub) 259,

(b) a baffle 248 extending radially outward from the tubular post (hub) 259, the baffle

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having opposing first surface 251 and a second surface,

(c) first ridges (vanes) 245 on the first surface of the baffle each vane comprising arcuate plate that curves outward from the hub; and

whereby the first vanes direct the received gas across process chamber 30 surface (Column 6, line 20 to Column 7, line 30).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use hub and baffle plate configuration as taught by Murugesh et al in the apparatus of Redeker et al to enable uniformly remove residues having variable thickness or non-uniform chemical compositions without eroding underlying chamber surfaces (Column 1, lines 55-60).

Redeker et al in view of Murugesh et al do not teach second vanes on the second surface of the baffle and where the second vanes direct the received gas across the second surface of the baffle.

Tzu et al teach an apparatus (Figures 3, 6-8) that includes a baffle plate 36 coupled to lid 20a opposite the gas manifold 34. Tzu et al further teaches that bottom surface (second surface) 36b of baffle plate 36 has a mixing lip 704 that includes sculptured surface 802 or any similar surface features to control the flow of gases exiting the baffle plate (Paragraphs 0036-0040).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use surface features on bottom (second) surface of baffle plate as taught by Tzu et al in the apparatus of Redeker et al in view of Murugesh et al to provide control of flow of gases exiting the baffle plate (Paragraphs 0039, 0040).

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Redeker et al in view of Murugesh et al and Tzu et al teach surface features on second surface of baffle plate but do not teach second vanes that direct the received gas across the second surface of the baffle plate.

Halsey et al teach an apparatus (Figures 2, 3A-C, 4B) that includes a gas diffuser 200 that has a gas inlet nozzle 302, body (baffle plate) 202 and guide vanes (second vanes) 210, 212 on the opposite (second) surface of body where each second vane comprising a surface inclined to the second surface of body (baffle plate) 202 and the second vanes direct the gas across the second surface of the baffle plate.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use baffle plate with second vanes as taught by Halsey et al in the apparatus of Redeker et al in view of Murugesh et al and Tzu et al to enable gas flow out of expansion spaces in equal amounts to achieve flow uniformity (Column 3, lines 1-10).

Redeker et al in view of Murugesh et al, Tzu et al and Halsey et al do not teach gas feed-through tube capable of allowing a process gas to by-pass the first and second vanes and enter the chamber.

Frijlink teaches an apparatus (Figure 1) that includes a gas outlet member (hub) 7 that includes concentric funnels (gas feed through tube) that includes inlet 1A for first precursor gas and inlet 1B for second precursor (Paragraph 0024).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use hub with gas fed through tube as taught by Frijlink in the apparatus of Redeker et al in view of Murugesh et al, Tzu et al and Halsey et al to enable supply plurality of gases through gas distributor.

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Regarding Claim 12: Murugesh et al teach (Figures 2A, 2B) the baffle 251 further comprises an outer perimeter, and wherein each ridge (first vane) 245 comprises an arcuate plate that curves outward from the hub to the outer perimeter of the baffle.

Murugesh et al also teach that ridges (vanes) 245 are shaped and sized so that so as to enable fresh flow of gases over selected chamber surfaces (Column 7, lines 12-30).

Regarding Claims 13, 14: Halsey et al teach (Figure 4B) that guide vanes (second vanes) 210, 212 comprise a plurality of surfaces that are inclined to the second surface of the body (baffle) 202, at least a portion of the inclined surfaces being below the terminus (exit point for gases flowing out of nozzle 302) of the second channels {Figure 3A-3C, Column 5, lines 45-55 and Column 7, lines 20-40}. Halsey et al also teach the pairs of inclined surfaces (of guide vanes 210, 212) are oriented to direct the gas across expansion surface (sector of the second surface of the baffle plate) 464. Halsey et al also teach that number of guide vanes may be selected as per process requirements (Column 5, lines 30-35).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rakesh Dhingra



Parviz Hassanzadeh  
Supervisory Patent Examiner  
Art Unit 1763